Project Introduction

As space missions become increasingly complex, they demand increased reliance on spacecraft to adjust to unexpected or unfamiliar events without the assistance of real-time human-in-the-loop control. Such conditions as a thruster failure moments before an automated docking, or imprecise or unknown inertial properties due to fuel slosh, partially deployed appendages, etc., can cause controllers to become unstable or otherwise unable to complete their objectives. Based on our prior work in control systems and specifically in developing the existing Synchronized Position Hold, Engage, & Reorient Experimental Satellites (SPHERES) ISS testbed, we propose to analytically characterize the requirements to implement algorithms for autonomous thruster fault identification, fuel slosh and online inertia property estimation on the SPHERES system. This Phase I effort will focus on the necessary software architecture changes and any hardware modifications required to implement these algorithms using SPHERES. Successful completion of this effort will produce specifications and preliminary designs for all necessary components, and pending a manifest opportunity, lead to testing the new algorithms in ISS within Phase II. This proposal offers valuable innovation in three respects: creation of novel spacecraft control algorithms, rapid advancement from concept to spaceflight demonstration, and low-cost/high-return use of existing spaceflight resources.

Primary U.S. Work Locations and Key Partners
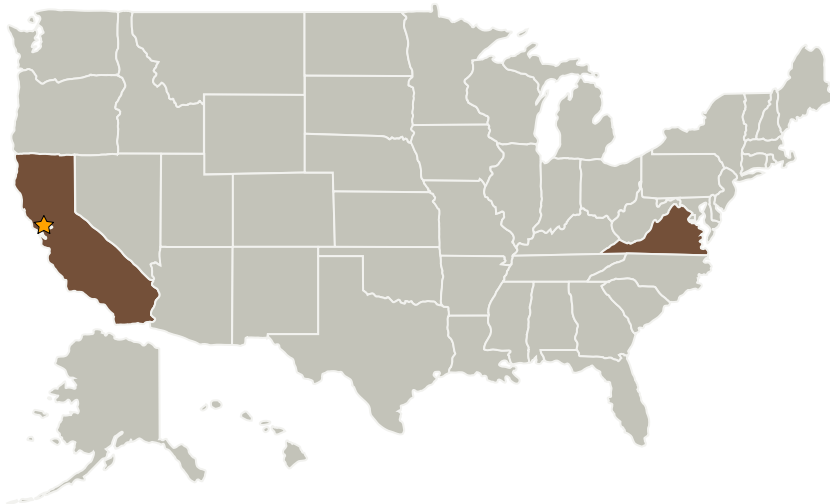

SPHERES Autonomy and Identification Testbed, Phase I

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Organizations Performing Work	Role	Type	Location
⭐Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Aurora Flight Sciences Corporation	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
California	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Javier Deluis

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  └ TX17.1 Guidance and Targeting Algorithms
    └ TX17.1.1 Guidance Algorithms